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Report No.	GECPL/301222-827/A

GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED RESIDENTIAL APARTMENT AT VALGERAHALLI, BENGALURU

CLIENT

The Executive Engineer,

Bangalore Development Authority,

T Chowdaiah Road, Kumarapark West,

Bengaluru – 560 020

CONSULTANTS

M/s. ACS Design Consulting Pvt. Ltd.

"ARNAV", 4th Floor, 1150,

13th Cross Road, 1st Phase, 1st Stage,

Chandra Layout,

Bengaluru

GEO-ENGINEERING COMPANY PVT. LTD.

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Bengaluru - 560 058

Report on	:	Geotechnical investigation for the proposed Residential Apartment at Valgerahalli, Bengaluru
Report No	:	GECPL/301222-827/A
Report for	:	The Executive Engineer, Bangalore Development Authority, T Chowdaiah Road, Kumarapark West, Bengaluru – 560 020
Reference	:	Telephonic Confirmation dated Dec 28, 2022
Field investigation carried out by	:	Mr. Sunil Das & Team, Site Engineer
Managing Director	:	Dr. Jayaprakash K N
Technical Advisor	:	Mr. Umesh Kumar N Technical Manager (Geo-Technical Engg)
Report By	:	Ms. Pankaja B S Geo-Technical Engineer
Date of submission of report	:	07.01.2023

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INTRODUCTION

The Executive Engineer, Bangalore Development Authority, Bengaluru had entrusted us with the work of carrying out the geotechnical investigation for the proposed Residential Apartment (Single Basement, Stilt+10 floors) at Valgerahalli, Bengaluru. The primary objective of this investigation is to establish the geotechnical condition at the site and to evaluate the allowable bearing pressure and other engineering design parameters through the various field and laboratory tests. This report consists of the details about the field and laboratory tests performed and the recommendations made based on the test results.

SCOPE

The scope of work includes both the field and laboratory tests. Three boreholes by manual auger method were drilled in the construction area to obtain the sub-surface stratification. Fig A: shows the location of the boreholes on the entire plan of the proposed construction site. ***Refer Annexure I***

FIELD INVESTIGATION

Boring and Sampling

150 mm diameter boring at all places is carried out in accordance with IS: 1892 -2021 Code of Practice for sub-surface investigation of foundation by adopting auger boring. Representative / undisturbed samples are collected at different depths as the boring operation progressed. Various laboratory tests are conducted on the samples collected. Standard penetration tests are conducted at every 1.50m interval as per IS: 2131 – 1981.

Field testing

Standard penetration test

Standard Penetration Test (SPT) is carried out at different depths in all the boreholes & the 'N' values are recorded. The number of blows required to drive a 50mm diameter split spoon sampler for a depth of 30cm using a 65 kg hammer for a drop of 75cm is recorded as 'N' value.

The results of all the penetration tests are performed in each of the boreholes and they are shown in their respective Bore logs ***(Refer Annexure II)***. The test is halted if,

i) 50 blows are required for any 150mm penetration.

ii) 100 blows are required for 300mm penetration.

iii) 10 successive blows produce no advance and the N – value is recorded as "REFUSAL".

LABORATORY TESTING

Samples procured were transported to laboratory for obtaining Index and Engineering properties. In the laboratory, samples were visually classified by Geotechnical Engineer. Laboratory tests are being carried out as per relevant IS: 2720 guidelines.

Generally Soil Samples were tested for following parameters

- Particle Size analysis
- Natural Moisture content
- Atterberg's limits

The above said test results are tabulated. ***Refer Annexure III.***

SUB SOIL PROFILE

The sub-soil formations comprise of from top nil to termination depth brownish silty Sand/gravelly Sand was encountered. All the boreholes are terminated at the stage of "REFUSAL" (N>50). During the time of investigation water table was not encountered within the borehole termination depth; however the same may be subjected to seasonal fluctuations.

CONCLUSIONS

The following conclusions are drawn based on field and laboratory investigations.

1. Pit excavation was done by the client up to 4.0m depth below natural ground level before start of investigation.
2. All the boreholes are terminated at the stage of "REFUSAL" (N>50).
3. During the time of investigation water table was not encountered within the borehole termination depth; however the same may be subjected to seasonal fluctuations.
4. The sub soil varies from top nil to termination depth medium dense to dense strata was noticed.
5. The atterberg's limits indicate that the sub-soil is low to medium compressible in nature.

RECOMMENDATIONS

The following recommendations are made based on the detailed investigation conducted at the proposed construction site.

1. The foundation for the structure having basement shall be taken to a minimum depth of 1.5m below the basement floor level.
2. Isolated/combined footing up to width of 2.0m may be designed with the following allowable bearing pressure of, which gives a factor of safety of 2.5 against shear failure and for an allowable settlement of 25mm;

Depth below basement floor level, m	**Net SBC, kN/m^2**
1.5	**250**

Basement depth adopted as 3.6m below EGL: Detail's furnished by Client.

*Note 1: During excavations, in case any variation is noticed in the **strata /seepage** same shall be brought to the notice of geotechnical engineer for review of net SBC recommended.*

3. The bottom of foundation shall be properly leveled and verified for loose pockets/weaker zones and if found, the same shall be replaced with lean concrete.

for GEOENGINEERING COMPANY PRIVATE LTD

(Dr. JAYAPRAKASH K N)

ANNEXURE I

NOTE: *Drawing issued by Client.*

Fig A: Location of Bore holes

ANNEXURE II

Client	The Executive Engineer, Bangalore Development Authority	**BOREHOLE - 01**	**Size of Borehole**	150mm
Job No	827		**Ground Water Table**	Nil
Project	Residential Apartment		**Commenced**	30.12.2022
Location	Valgerahalli		**Completed**	30.12.2022

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Depth below NGL (m)**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
					1st 15cm	**2nd15cm**	**3rd15cm**				
					N_1	**N_2**	**N_3**				
Pit Excavation up to 4.0m	0.00		-4.00								
Brownish silty Sand	0.5		-4.50	SPT	50B/10cm	R		>70			***Refusal Strata***

SPT=Standard Penetration test	Refusal means SPT N>50	B= No. of blows	R=Rebound	SR: Soft Rock
HR:Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock		MWR: Moderately weathered rock

Bore hole was terminated at the stage of "REFUSAL STRATA"

Client	The Executive Engineer, Bangalore Development Authority	**BOREHOLE - 02**	**Size of Borehole**	150mm
Job No	827		**Ground Water Table**	Nil
Project	Residential Apartment		**Commenced**	30.12.2022
Location	Valgerahalli		**Completed**	30.12.2022

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Depth below NGL (m)**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
					1st 15cm	**2nd15cm**	**3rd15cm**				
					N_1	**N_2**	**N_3**				
Pit Excavation up to 4.0m	0.00		-4.00								
Brownish silty Sand	0.8		-4.80	SPT	50B/08cm	R		>70			***Refusal Strata***

SPT=Standard Penetration test	Refusal means SPT N>50	B= No. of blows	R=Rebound	SR: Soft Rock
HR:Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock		MWR: Moderately weathered rock

Bore hole was terminated at the stage of "REFUSAL STRATA"

Client	The Executive Engineer, Bangalore Development Authority	**BOREHOLE - 03**	**Size of Borehole**	150mm
Job No	827		**Ground Water Table**	Nil
Project	Residential Apartment		**Commenced**	30.12.2022
Location	Valgerahalli		**Completed**	30.12.2022

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Depth below NGL (m)**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
					1st 15cm	**2nd 15cm**	**3rd 15cm**				
					N_1	**N_2**	**N_3**				
Pit Excavation up to 4.0m	0.00		-4.00								
Brownish gravelly Sand	0.5		-4.50	SPT	50B/12cm	R		>70			***Refusal Strata***

SPT=Standard Penetration test	Refusal means SPT N>50	B= No. of blows	R=Rebound	SR: Soft Rock
HR:Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock	MWR: Moderately weathered rock	

Bore hole was terminated at the stage of "REFUSAL STRATA"

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LABORATORY TEST REPORT ON SOIL SAMPLES

Client	**The Executive Engineer, Bangalore Development Authority**	**Project**	**Residential Apartment**	**Job No.**	**827**
Location	**Valgerahalli**	**Date of Sample Recieved**	**30.12.2022**	**Date of Test**	**31.12.2022**

ANNEXURE III

BH No.	Sample Type	Sample no.	Depth (m)	Grain Size Distribution (%)					Atterberg Limits (%)			Free Swell Index (%)	IS Classification (IS:1498-1970)	Natural Moisture Content (%)	Bulk Density (gm/cc)	Specific Gravity	Shear Parameters		Description of Soil Strata
				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Liquid Limit	Plastic Limit	Plasticity Index						Cohession (kN/m^2)	Angle of Internal Friction (deg.)	
1	SPT	1222/585	0.5	0.2	2.0	32.1	33.6	32.1	35.3	---	NP	---	SC	7.0	---	---	---	---	silty Sand
2	SPT	1222/586	0.8	0.2	3.7	35.6	29.5	31.0	35.6	---	NP	---	SC	11.2	---	---	---	---	silty Sand
3	SPT	1222/587	0.5	32.8	10.2	25.2	15.8	16.0	36.1	---	NP	---	SC	7.4	---	---	---	---	gravelly Sand

This report relates only to the sample tested and shall not be reproduced except in full without written approval of laboratory management

Authorised Signatory

Abrreviations used: UDS: Undisturbed Sample, DS: Disturbed Sample, SPT: Standard Penetration Test, BH: Bore Hole, NP: Non Plastic			
Test Method Referred to:	Grain Size Distribution: IS 2720-4 1985 RA 2015	Liquid and Plastic Limit: IS 2720-5 1985 RA 2015	Specific Gravity: IS 2720-3 SECTION 1 & 2 1980 RA 2016
	Direct Shear Test: IS 2720-13 1986 RA 2016	Free Swell Index: IS 2720-40 1977 RA 2016	Natural Moisture Content: IS 2720-2 1973 RA 2016
Test Method Variation :	None		

END OF TEST RESULTS

ANNEXURE IV

GRAIN SIZE ANALYSIS CURVES

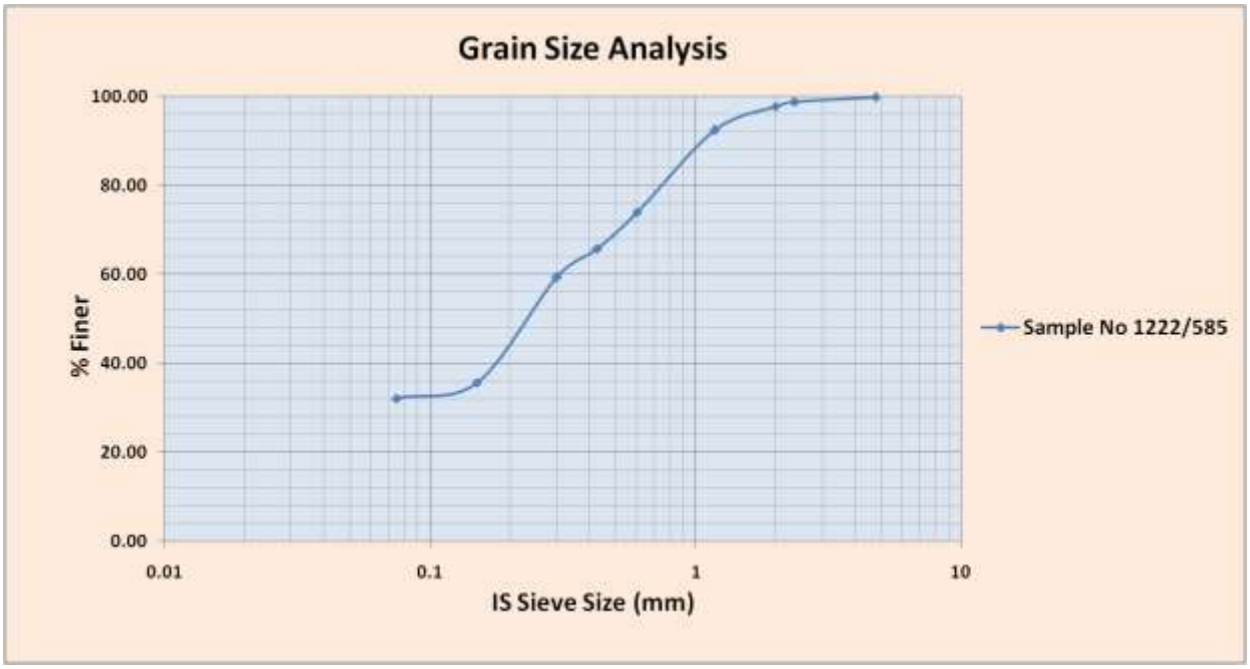

Fig. No.1: Grain size analysis Curves around BH 1

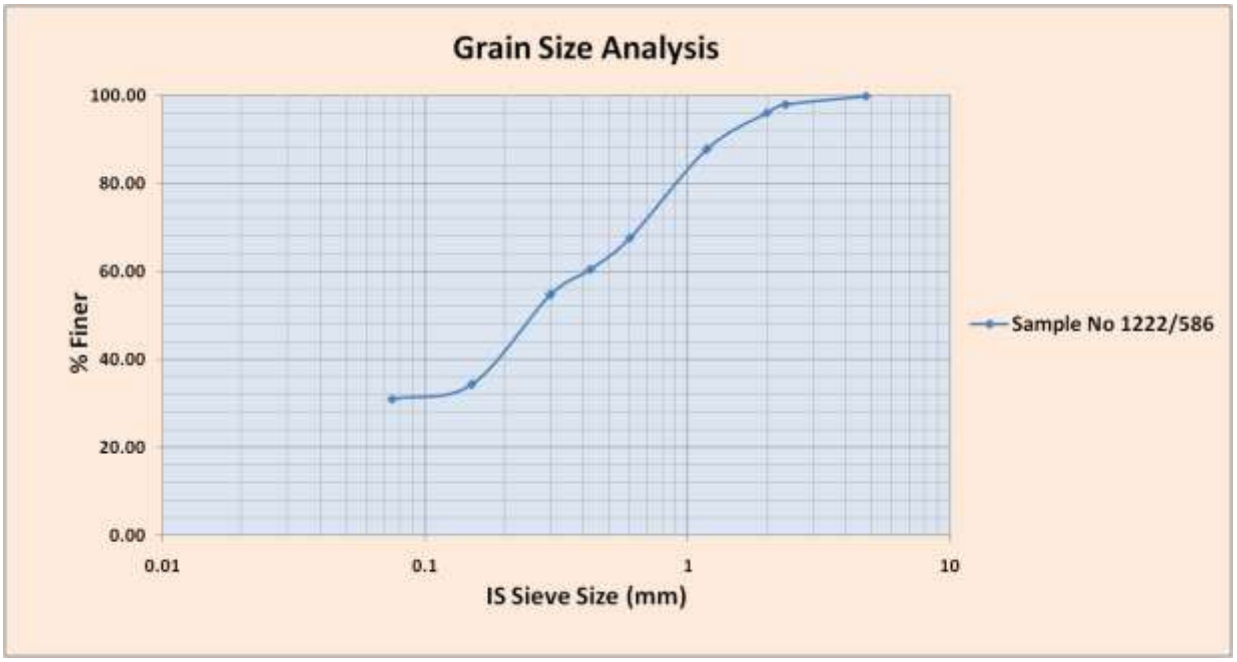

Fig. No.2: Grain size analysis Curves around BH 2

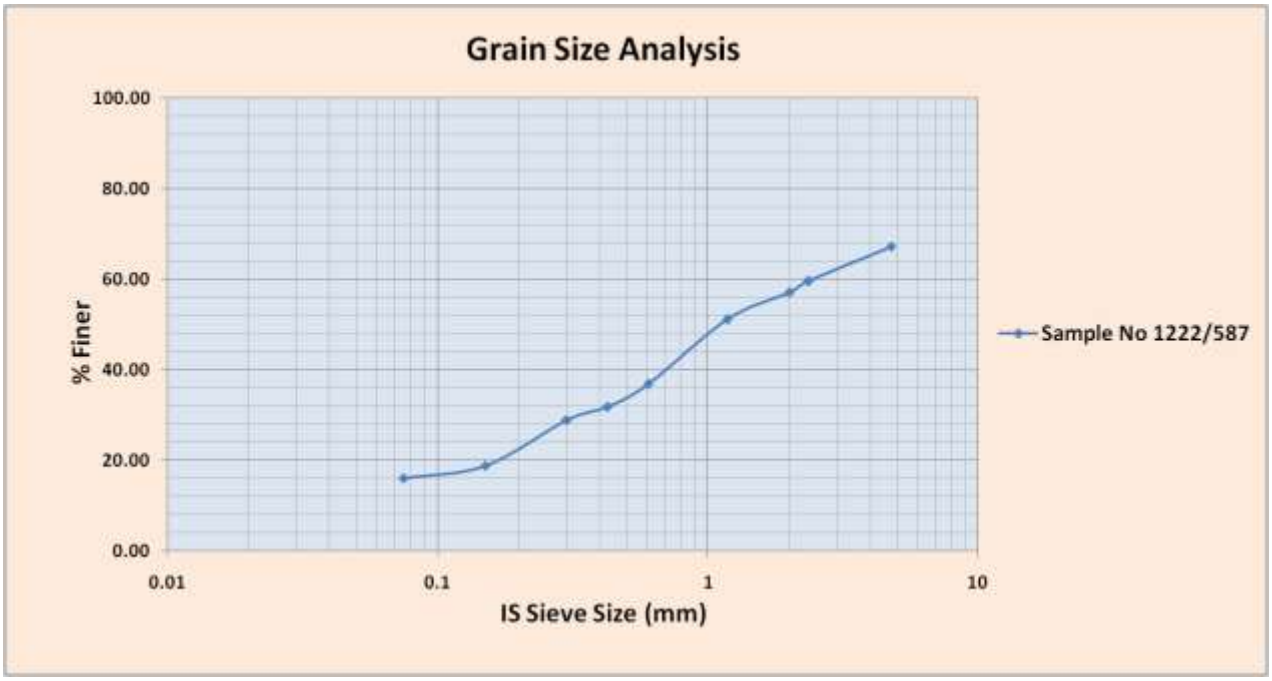

Fig. No.3: Grain size analysis Curves around BH 3

*****END OF REPORT*****